

DISEASE RECORDS FOR IMPACTFUL DECISIONS DURING THE VITAL 90™ DAYS

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The Vital 90™ Days is a key period in the production cycle of a dairy cow that spans from approximately 60 days before calving to 30 days after calving. Management decisions during this high-risk period are key drivers of the success or failure for the cow's new lactation. Most health disorders occur or can be attributed to this critical phase and it is also when dairy producers invest heavily to reduce the incidence and/or severity of these transition cow diseases.

Kelton et al (1998) published recommendations on recording and calculating the incidence for eight clinically identifiable diseases of economic importance to the dairy industry. The diseases considered in this paper were: milk fever, retained placenta, metritis, ketosis, left displaced abomasum, cystic ovarian disease, lameness, and clinical mastitis. Many veterinarians, including the authors, have used this paper and its recommendations when introducing guidelines and standards for the reporting of data related to the health of cattle. There continues to be a strong interest within the dairy industry in the recording and analysis of clinical disease data, with the goal of assisting dairy producers and their advisors in making impactful decisions.

Conceptually, it is helpful to consider two broad categories of medical decisions dairy producers and their advisors are faced with:

1. Individual cow decisions
2. Herd health program decisions

Using on-farm records facilitates both categories of medical decisions and results in making a positive impact on both the individual cow in the herd and also on the dairy business operation.

Many of the common clinical disease conditions in dairy cows are closely associated with calving, and therefore the highest period of risk is in the first 30 days after calving. This presentation will focus specifically on monitoring the level of transition cow diseases. These are the common disease consequences that occur in the first 30 days of lactation. Also outlined in this presentation will be a process to facilitate making the appropriate individual cow treatment decisions, capture the data into an on-farm record system, and utilize reporting of the data to influence herd health program decisions. The key steps necessary in this process are:

- Define the conditions (diseases) to be tracked
- Describe the clinical signs of the disease
- Detect and Monitor
- Decide (Individual Cow): Record and Treat
 - Create standard protocols available for treatment options and recording
 - Utilize decision tools to choose specific protocol for a given case

- Analyze
- Decide (Herd Health Program): Change management or treatment protocols if needed

To be able to make impactful decisions using clinical disease records (the end goal), we must start with standardized disease event case definitions. Adapted from Kelton et al (1998), these proposed definitions set the foundation that allows detection and monitoring programs to be developed. This document describes monitoring the level of disease events occurring on a dairy operation during The Vital 90TM Days. The document utilizes a managerial monitoring approach and is intended to be independent of the software used to calculate the performance indicators. Managerial monitoring is a dynamic monitoring system used by a business operation internally to improve work processes in a business unit. It does not require industry wide standardization of work and therefore is not intended for industry performance benchmarking purposes.

COMMON CLINICAL DISEASE CONDITIONS THAT OCCUR DURING THE VITAL 90TM DAYS

Metritis (METR)

Clinical metritis is recognized by an abnormal (smelly and watery) uterine discharge within 21 days of calving. On palpation per rectum, the uterus appears flaccid, not contracting normally, and fluid filled.

- Mild Clinical Metritis is metritis without a fever or other clinical signs apart from the uterine changes.
- Severe Clinical Metritis is metritis with the presence of clinical signs that may include fever, depression, and lack of strong appetite.

Ketosis (KETOSIS)

Ketosis is recognized when animals are identified with elevated ketone bodies in the blood ($>1200 \mu\text{mol/L}$), milk ($>100 \mu\text{mol/L}$), or urine in the absence of concurrent disease. The risk period for transition related ketosis is usually the first 30 DIM, but testing is most commonly performed during weeks 1 and 2 after calving when the risk is highest.

Clinical Ketosis is a more severe form of ketosis where the cow shows clinical signs of decreased appetite, decreased milk production, or abnormal behavior in the absence of another concurrent disease.

- Primary clinical ketosis is clinical ketosis that occurs prior to or without any other concurrent disease.
- Secondary clinical ketosis is clinical ketosis that occurs in conjunction with another disease process.

Displaced Abomasum (DA)

Displaced abomasum (DA) is recognized when a ping is detected by thumping or tapping the cow's body wall while simultaneously listening with a stethoscope in the area between the 9th and 12th ribs above and below an imaginary line extending from the hip to the elbow on each side of the animal on the abdominal wall. DA can occur on either the right or left side.

Retained Placenta (RP)

Retained Placenta is recognized when the fetal membranes (placenta) are still visible hanging from the cow's vulva 24 hours or more after calving.

Milk Fever (MF)

Clinical milk fever is identified if a cow of lactation 2 or more displays clinical signs that include muscle weakness, nervousness, muscle shaking, cold ears and eventually the cow being unable to rise. This condition is caused by low blood calcium levels and usually occurs within 3 days of calving.

Clinical Mastitis (MAST)

Clinical mastitis is recognized by visually observing abnormal milk from a quarter. Clinical mastitis can be classified as mild, moderate, or severe based on whether the cow shows any additional clinical signs beyond abnormal milk.

- Severity score of 1 or Mild mastitis: Abnormal milk only
- Severity score of 2 or Moderate mastitis: Abnormal milk + inflammation of udder (e.g., redness or swelling)
- Severity score of 3 or Severe mastitis: Abnormal milk + inflammation of udder + sick cow (e.g., depression, poor appetite)

Note that clinical mastitis can occur both within The Vital 90TM Days and at other points in the lactation.

Ovarian Dysfunction (OVDYSF)

Ovarian Dysfunction is recognized when a cow is examined and determined to have ovarian problems that are causing abnormal patterns of heat expression (showing heat too often or not showing heat at all).

While Ovarian Dysfunction can certainly impact the future reproductive performance, its definition is not a specific disease and it typically is not diagnosed during The Vital 90TM Days. In most cases it will not be tracked as an independent event.

Lameness (LAME)

Lameness is recognized when a cow is observed walking or standing abnormally due to a problem in the foot, leg or hip. Note that lameness can occur both within The Vital 90™ Days and at other points in the lactation.

Pneumonia (PNEU)

Pneumonia is recognized when a cow is observed with altered breathing patterns and/or respiratory sounds due to a respiratory infection. Most cases of pneumonia have a fever but some do not. Note that pneumonia can occur both within The Vital 90™ Days and at other points in the lactation.

When a disease condition is accurately detected, an appropriate treatment decision can be made. An important role of on-farm management software should be to facilitate guiding the delivery of treatments to the correct cows and compliance to prescribed therapies. Transition disease event entry should be promoted by veterinarians, consultants, and farm managers because it facilitates the delivery of the proper treatments to the correct cows. Farm management must define the approved treatment protocols to be used working with their farm's Veterinarian of Record. The Veterinarian of Record is the responsible party for providing appropriate oversight of drug use on the farm operation. Written protocols should include: A Protocol Name, Medications used and specific directions for use (including duration of therapy and any milk and/or meat withdrawal periods). The primary purpose of data entry is to capture the data needed to guide the implementation of approved treatment protocols. With the supervision of the Veterinarian of Record, on-farm software can assist the animal care workers in delivering the highest quality medical and supportive care to the animals in their production unit.

Disease frequency is commonly reported as the rate of occurrence of new cases of a disease in a defined population at-risk for the disease per unit of time. By utilizing the on-farm software to make high quality individual cow decisions, the necessary data is captured to allow the appropriate disease incidence risk calculations to be conducted. Analysis of disease incidence data from The Vital 90™ Day period can then be accomplished using a very complete and accurate on-farm data set.

In basic terms, a transition disease incidence calculation includes a numerator and a denominator.

- The numerator is a count of the first event of a lactation occurring within the first 30 days in milk (technically this is known as the incident case) and within a calendar time period of "X". By limiting the count to the first event that occurs in the first 30 days in milk, the period of analysis has a minimal lag-time to allow timely on-farm decisions to be made. Although a longer period of analysis may be of interest, increasing the period of analysis too much renders the overall calculation too historical to be useful in a managerial monitoring program. Time period "X" refers to a specified calendar period that is the same for both the

numerator and denominator. Traditionally, this length of time has been the previous 12 months, but for analysis purposes could range from 1 to 12 months depending upon the size of the herd and the specific question being asked. Time period “X” is commonly stratified by month of calving, but in larger herds it may be useful to stratify by week of calving.

- The denominator is the population of cows at risk during time period “X”. Kelton et al (1998) suggested that for diseases that are closely associated with calving for which the period of risk is relatively short, analysis may be based on the number of lactations initiated and could be reported as a Lactational Incidence Risk (LIR). Commonly in on-farm record systems, lactations initiated would be a simple count of the FRESH events during a specific period of time.

Month	Fresh	Event	Risk	68% CI
Jan14	254	47	19%	16-21%
Feb14	239	42	18%	15-20%
Mar14	259	28	11%	9-13%
Total	752	117	16%	14-17%

Figure 1. Example Event Data by month

Since the calculation is estimating the risk (%) for the first 30 DIM, animals must have calved 31 or more days prior to the evaluation to ensure that a full 30 days of at-risk time is achieved. In the above example, the incidence risk for Mar14 can first be calculated starting on the first day of May14.

During the process of managerial monitoring, understanding what is being measured and how it is calculated is only the first part of the decision process. The second part will be to understand reliability of the answer presented in the monitoring report.

Care must be taken when looking at event (disease) incidences. There is always uncertainty around estimates of incidences. Hence, this paper presents expressing risks as 68% Confidence Intervals (CI) rather than simple percentages. The Confidence Interval is a tool that can help us understand the reliability of the answer presented.

The 95% CI has become a standard that is commonly used in scientific research. One way to interpret the 95% CI is that 19 times out of 20, when we look at sampled disease event incidence data, we would expect that the true point estimate of the incidence is likely to fall within the range of numbers listed. A 95% CI basically means that with repeated sampling of the data, we can be 95% confident that the true average (point estimate for the incidence) falls within the range of numbers listed. Much time is spent in designing research projects to determine the number of animals needed in a study to be 95% confident that a difference in outcomes is statistically significant.

How confident do farm managers need to be to make a management decision? The 68% CI means that 17 times out of 25, when we look at this data we should expect the average would fall within the range of numbers listed. The level of confidence needed to make a management decision is almost always less than the level of confidence

needed to make a scientific declaration. Waiting for 95% confidence for decision making often results in major delays in intervention due to smaller data sets or large amounts of variation.

If one is comparing the disease incidence in two different months, and the disease event incidence in one month has a 68% CI range of 19% to 25%, and the second month has a disease event incidence range of 20% to 40%, we can be reasonably confident about two things: 1) statistically there is no difference between the disease event incidence of these two months; 2) the first month has a larger number of cows at-risk that are being measured than the second one.

When dealing with numbers, it quickly becomes obvious that the more animals one has in the incidence calculation, the smaller the confidence limits are likely to be and changes in performance can be detected more quickly. This is one advantage a large dairy has over a small one. It does not mean that a large dairy is a better run dairy than a small one nor does it mean a small dairy should not look at their numbers. "Their numbers" are still the most important thing for them to follow. However, due to variability of these numbers, the small dairy manager will often not be able to demonstrate statistical significance. Both small and large dairy managers should always be careful when interpreting report numbers. Not only should the dairy's numbers be watched but they need to be compared with what others have seen, what past experience has been and what other conditions could be affecting the outcomes. The Veterinarian of Record working with the farm management team is able to provide important expertise that is essential to having decisions made with disease incidence records make a positive impact on the dairy operation.

Monitoring of disease consequences that occur during The Vital 90™ Days can be utilized by the Veterinarian of Record, other consultants, and the farm management team to evaluate compliance to the approved herd strategy for the necessary medical treatment of clinical disease events when they occur. In addition, complementary reports related to transition disease incidence risk may be used to provide feedback to the management team about the herd health program strategy for managing negative energy balance and immune suppression during The Vital 90™ Days.

REFERENCES

Kelton DF, Lissemore KD, Martin RE. Recommendations for recording and calculating the incidence of selected clinical diseases of dairy cattle. *J Dairy Sci.* 1998;81(9):2502-2509.